a canister for emitting a puff of calibration gas in the path of the beam between the source and the receiver, said calibration gas having a known reference composition of gas which absorbs radiation at the predetermined wavelengths;

a data processing computer for computing a gas mixture composition from the sensed radiation levels in accordance with stored calibration curves;

a trigger device that produces a trigger signal when a vehicle passes through the beam causing the data processing computer to record the gas mixture composition of the vehicle's exhaust plume for a period of time;

an automated control computer that

a) calibrates the data processing computer by directing the canister to emit a puff of calibration gas, whereby the data processing computer recomputes the calibration curves in accordance with the known reference composition;

b) verifies the calibration by directing the canister to emit a puff of calibration gas, whereby the data processing computer computes a test composition from the radiation levels and accepts the calibration when the test composition is close enough to the known reference composition and otherwise rejects the calibration and initiates [recalibration] a new calibration; and

c) monitors the gas mixture composition of the ambient air to control [recalibration] calibration

of the data processing computer; and

a vehicle identification device that responds to the trigger signal by recording a vehicle identification for the passing vehicle.

Amend claim 2 as follows:

2. (Amended) The [unmanned optical] emissions sensor of claim 1, further comprising:

a multi-position lens cover on the receiver, said automated control computer indexing the position of the lens cover when the gas mixture composition of the ambient air deviates from an ambient reference level by more than a specified threshold and initiates [recalibration] a new calibration if the deviation remains greater than the specified threshold.

Amend claim 3 as follows:

3. (Amended) The [unmanned optical] emissions sensor of claim 1, wherein the automated control computer monitors the gas mixture composition of the vehicle's exhaust plume to control [reverification] verification of the calibration and initiation of a new calibration.

Amend claim 4 as follows:

4. (Amended) The [unmanned optical] emissions sensor of claim 1, wherein the automated control computer monitors a time from the last calibration and when the time exceeds a mandatory recalibration period it initiates [another] a new calibration.

Amend claim 5 as follows:

5. (Amended) The [unmanned optical] emissions sensor of claim 1, wherein the automated control computer monitors the data processing computer and power cycles the emissions sensor when the data processing computer fails to produce gas mixture compositions.

Amend claim 6 as follows:

6. (Amended) The [unmanned optical] emissions sensor of claim 1, further comprising:

a [manned] control center; and

a communications channel for communication between the automated control computer and the [manned] control center, said automated control computer responding to repeated calibration rejections by transmitting a help message to the [manned] control center, which in turn responds by performing diagnostics to determine a cause for the calibration rejection and then either [remedy] remedies the cause remotely or [dispatch] dispatches a technician to remedy the cause on site.

Amend claim 7 as follows:

7. (Amended) The [unmanned optical] emissions sensor of claim 1, further comprising:

a vehicle detector for sensing an oncoming vehicle and computing its acceleration, said data processing computer disabling the [recordation] recording of the composition of the vehicle's exhaust plume when the acceleration exceeds a threshold.

Amend claim 8 as follows:

8. (Amended) The [unmanned optical] emissions sensor of claim 7, wherein the vehicle detector [compute's] computes the vehicle's speed and computes a time-to-trigger range from the vehicle's measured speed and acceleration, said data processing computer disabling the [recordation] recording of the composition of the vehicle's exhaust plume when triggering occurs outside the time-to-trigger range.

Amend claim 9 as follows:

9. (Amended) The [unmanned optical] emissions sensor of claim 7, wherein said source and said receiver are placed on the same side of the road, further comprising:

a reflector that is positioned on the other side of the road such that the beam emitted by the source reflects off of the reflector and back to the receiver.

Amend claim 10 as follows:

10. (Amended) The [unmanned optical] emissions sensor of claim 9, further comprising:

a single console that [contains] comprises the source, the receiver, the canister, the data processing computer, the automated control computer, the vehicle identification device, and the vehicle detector.

Amend claim 11 as follows:

11. (Amended) The [unmanned optical] emissions sensor of claim 10, wherein the vehicle identification device comprises an automated license plate reader (ALPR) [that reads the vehicle's license at an angle of at least 20 degrees and said vehicle detector senses the oncoming

vehicle at an angle of at least 20 degrees to maintain a vehicle throughput].

Amend claim 12 as follows:

12. (Amended) The [unmanned optical] emissions sensor of claim 10, wherein one of said source and said receiver is positioned above the other so that the beam traverses [the road in] a low path in one direction and [in] a high path in the other direction so that the trigger device will trigger on both high and low ground clearance vehicles.

Amend claim 13 as follows:

13. (Amended) An [integrated optical] emissions sensor for sensing a gas mixture composition of an exhaust plume of a motor vehicle [travelling along a road], comprising:

a [single] console that is positioned at one side of [the road] a detection space;

a vehicle detector in said console for sensing an oncoming vehicle and computing its acceleration;

a source in said console for radiating a beam of light along a path [across the road] such that the beam passes through the exhaust plume of a passing vehicle and otherwise passes through ambient air;

a reflector that is positioned on the other side of the [road] detection space such that the beam reflects off of the reflector and back to the console;

a receiver in said console sampling radiation levels at a plurality of predetermined wavelengths from the beam;

a data processing computer in said console for computing a gas mixture composition from the sensed radiation levels in accordance with stored calibration curves;

a canister in said console for emitting a puff of calibration gas in the path of the beam between the source and the receiver to [recompute] compute the calibration curves;

a trigger device in said console that produces a trigger signal when a vehicle passes through the beam causing the data processing computer to record the gas mixture composition of the vehicle's exhaust plume for a period of time[, said data processing computer disabling the recordation of the composition of the vehicle's exhaust plume when the acceleration exceeds a threshold]; and

a vehicle identification device in said console that responds to the trigger signal by recording a vehicle identification for the passing vehicle.

Amend claim 14 as follows:

14. (Amended) The [unmanned optical] emissions sensor of claim 13, wherein the vehicle identification device comprises an automated license plate reader (ALPR) [that reads the vehicle's license at an angle of at least 20 degrees and said vehicle detector senses the oncoming vehicle at an angle of at least 20 degrees to maintain a vehicle throughput].

Amend claim 15 as follows:

15. (Amended) The [unmanned optical] emissions sensor of claim 13, wherein one of said source and said receiver is positioned above the other so that the beam traverses the [road] detection space in a low path in one direction and in a high path in the other direction [so that the trigger device will trigger on both high and low ground clearance vehicles].

Amend claim 16 as follows:

16. (Amended) The [unmanned optical] emissions sensor of claim 13, wherein the vehicle detector compute's the vehicle's speed and computes a time-to-trigger range from the vehicle's measured speed and acceleration, said data processing computer disabling the [recordation] recording of the composition of the vehicle's exhaust plume when triggering occurs outside the time-to-trigger range.

Amend claim 17 as follows:

17. (Amended) The [unmanned optical] emissions sensor of claim 13, wherein said calibration gas has a known reference composition of gas which absorbs radiation at the predetermined wavelengths, further comprising an automated control computer that

a) calibrates the data processing computer by directing the canister to emit a puff of calibration gas, whereby the data processing computer [recomputes] computes the calibration curves in accordance with the known reference composition;

b) verifies the calibration by directing the canister to emit a puff of calibration gas, whereby the

data processing computer computes a test composition from the radiation levels and accepts the calibration when the test composition is close enough to the known reference composition and otherwise rejects the calibration and initiates [recalibration] a new calibration; and

c) monitors the gas mixture composition of the ambient air to control [recalibration] calibration of the data processing computer.

Amend claim 18 as follows:

18. (Amended) A remote emissions sensing system sensing gas mixture compositions of exhaust plumes for motor vehicles traveling along a network of roads, comprising:

a plurality of [unmanned integrated optical] emissions sensors positioned at different places in the network on a side of the road, each emissions sensor comprising:

a console;

a vehicle detector in said console for sensing an oncoming vehicle and computing its acceleration;

a source in said console for radiating a beam of light along a path across the road such that the beam passes through the exhaust plume of a passing vehicle and otherwise passes through ambient air;

a reflector that is positioned on the other side of the road such that the beam reflects off of the

reflector and back to the console;

a receiver in said console that samples radiation levels at a plurality of predetermined wavelengths from the beam;

a data processing computer in said console for computing a gas mixture composition from the sensed radiation levels in accordance with stored calibration curves;

a canister in said console for emitting a puff of calibration gas in the path of the beam between the source and the receiver, said calibration gas having a known reference composition of gas which absorbs radiation at the predetermined wavelengths;

a trigger device in said console that produces a trigger signal when a vehicle passes through the beam causing the data processing computer to record the gas mixture composition of the vehicle's exhaust plume for a period of time[, said data processing computer invalidating the recordation of the composition of the vehicle's exhaust plume when the acceleration exceeds a threshold];

an automated control computer that

a) calibrates the data processing computer by directing the canister to emit a puff of calibration gas, whereby the data processing computer [recomputes] computes the calibration curves in accordance with the known reference composition;

b) verifies the calibration by directing the canister to emit a puff of calibration gas, whereby the data processing computer computes a test composition from the radiation levels and accepts the calibration when the test composition is close enough to the known reference composition and otherwise rejects the calibration and initiates [recalibration] a new calibration; and

c) monitors the gas mixture composition of the ambient air to control [recalibration] calibration of the data processing computer; and

a vehicle identification device in said console that responds to the trigger signal by recording a vehicle identification for the passing vehicle;

a [manned] control center; and

a communications channel for communication between the emissions sensors and the [manned] control center, said emissions sensors responding to repeated calibration rejections by transmitting a help message to the [manned] control center, which in turn responds by performing diagnostics to determine a cause for the calibration rejection and then either [remedy] remedies the cause remotely or [dispatch]dispatches a technician to remedy the cause on site.

Amend claim 19 as follows:

19. (Amended) The [unmanned optical emissions sensor] system of claim 18, wherein the vehicle detector of the emissions sensors compute's the vehicle's speed and computes a time-to-trigger range from the vehicle's measured speed and acceleration, said data processing computer

disabling the [recordation]recording of the composition of the vehicle's exhaust plume when triggering occurs outside the time-to-trigger range.

Amend claim 20 as follows:

20. (Amended) The [unmanned optical emissions sensor] system of claim 18, wherein the vehicle identification device of the emissions sensors comprises an automated license plate reader (ALPR) [that reads the vehicle's license at an angle of at least 20 degrees and said vehicle detector senses the oncoming vehicle at an angle of at least 20 degrees to maintain a vehicle throughput].

Amend claim 21 as follows:

21. (Amended) The [unmanned optical emissions sensor] system of claim 18, wherein one of said source and said receiver of said emission sensors is positioned above the other so that the beam traverses the road in a low path in one direction and in a high path in the other direction [so that the trigger device will trigger on both high and low ground clearance vehicles].

Please add the following new claims:

22. A device for sensing a gas mixture composition of an exhaust plume of a moving vehicle comprising:

a radiation source for projecting a beam through the exhaust plume of the moving vehicle;

a receiver for sampling transmittance of predetermined wavelengths from the beam;

a self-initiating calibration system for periodic automatic calibration of the device; and

a control computer for coordinating operation of the source, receiver, and calibration system.

23. The device of claim 22, wherein said receiver comprises an indexed lens cover mechanically operable in response to a signal from the control computer.

24. A system for monitoring emissions of moving motor vehicles comprising:

a plurality of remote emissions sensing devices deployed at a plurality of testing locations, said sensing devices automatically gathering emissions data on a plurality of moving vehicles; and

a central control, said central control connected to each of said plurality of remote emissions sensing devices via a communications channel, said central control receiving

emissions data on the plurality of moving vehicles and performing remote diagnostics on said plurality of remote emissions sensing devices.

25. A method of monitoring vehicle emissions comprising the steps of :

gathering vehicle emissions data in a remote vehicle emission testing device; and

periodically and automatically calibrating the remote vehicle emission testing device using a self-initiating calibration system.

26. The method of claim 25, further comprising the step of transmitting data to a control center over a communication channel.

27. The method of claim 25, wherein the step of gathering vehicle emissions data comprises the steps of:

radiating radiation along a path such that the radiation passes through the exhaust plume of a passing vehicle; and

sampling radiation transmittance at a plurality of predetermined wavelengths.

28. The method of claim 27, wherein the sampling step is carried out responsive to a trigger signal which indicates when a vehicle passes.

29. The method of claim 28, further comprising the step of:

determining information about one or more components of the vehicle emissions from the sampled radiation transmittance.

30. The method of claim 29, wherein the calibration step comprising the steps of:

providing a calibration gas of known composition in the path of the radiation;

sampling radiation transmittance of the calibration gas at a plurality of predetermined wavelengths;

determining information about at least two components of the calibration gas from the sampled transmittance;

comparing the determined information to stored calibration information;

generating new calibration information based on said comparison;

storing the new calibration information.

31. The method of claim 30, wherein the calibration step further comprises the step of verifying the calibration information.

32. The method of claim 31, wherein the verification step comprises the steps of:

providing a calibration gas in the path of the radiation;

sampling radiation transmittance of the calibration gas at a plurality of predetermined wavelengths;

determining information about at least two components of the calibration gas from the sampled transmittance;

comparing the determined information to the stored new calibration information; and

determining from the comparison if the calibration is within a predetermined acceptable range.

33. The method of claim 32, further comprising the steps of:

rejecting the calibration if it is determined not to be within a predetermined acceptable range; and

if the calibration is rejected, initiating recalibration.

34. The method of claim 25, further comprising the step of accounting for the amounts of components of interest in the ambient air at the location of the vehicle monitoring during said calibration step.

35. The method of claim 26, further comprising the step of transmitting an error signal to the control center after at least one failed attempt to calibrate the remote vehicle emission testing device.

36. The method of claim 25, further comprising the step of performing remote diagnostics on the remote vehicle emission testing device from a control center over a communication channel.

37. The method of claim 25, wherein the step of periodically and automatically calibrating the remote vehicle emission testing device comprises emitting gas of a known composition into a detection space and recalculating calibration values.

38. A method of monitoring vehicle emissions comprising:

gathering emissions data at a plurality of locations using a plurality of remote emissions sensing devices;

downloading emissions data gathered by the remote emissions sensing devices to a central control; and

performing remote diagnostic checks of the remote emissions sensing devices from the central control.

39. The method of claim 38, wherein the step of performing remote diagnostic checks comprises remotely initiating repeated calibration attempts and analyzing returned data.

40. The method of claim 38, wherein the step of performing remote diagnostic checks comprises remote actuation of a mechanical part of at least one of the remote emission sensing devices.

41. The method of claim 40, wherein the mechanical part is a receiver lens cover.